

Quantum Multiple Scattering Model of Heavy Ion Fragmentation (QMSFRG)

Completed Technology Project (2008 - 2010)



Project Introduction

New project for FY2008.

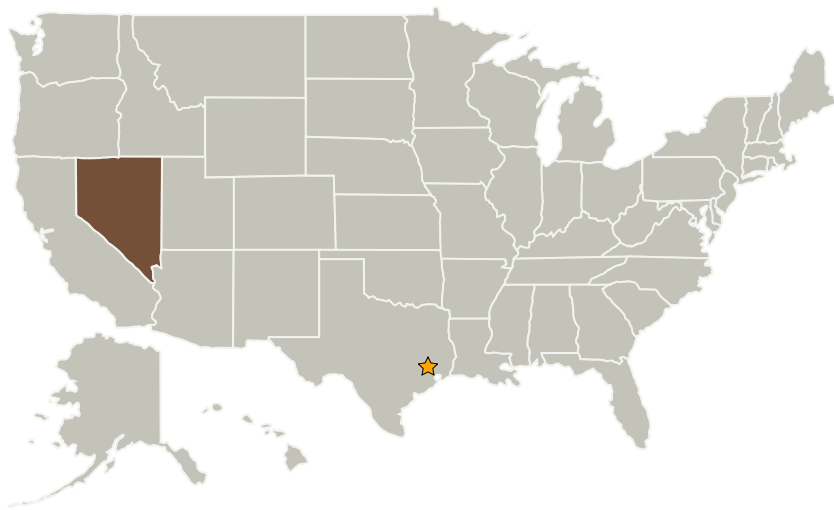
Anticipated Benefits

In space, astronauts are exposed to ionizing radiation that is quantitatively and qualitatively different from terrestrial radiation. This environment includes protons and high-Z high-energy (HZE) ions together with secondary radiation, including neutrons and recoil nuclei that are produced by nuclear reactions in spacecraft materials or tissue. Astronauts who are on missions to the ISS, the Moon or Mars are exposed to ionizing radiation with effective doses in the range of 50 to 2000 mSv (milli-Sievert) projected for possible mission scenarios. Similar doses from terrestrial radiation sources, such as gamma-rays and X-rays, are associated with an increased risk for development of cancer.

Permissible exposure limits (PEL) for Space Radiation limit the allowable mission and career exposure to the space radiation environment based on the projected risk of developing cancer. The PELs are set such that the confidence level of staying within the allowed risk limit is 95%. The use of a median risk estimate could greatly overestimate or underestimate the actual risk to crews because the uncertainties in risk projection models are significant ([95% confidence level/50% confidence level]>4).

Mission, vehicle, and crew selection requirements are outcomes of the Space Radiation PELs, including requirements on vehicle design, mission duration, and age, gender, or past mission history for crew selection.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Prairie View A & M University	Supporting Organization	Academia	Prairie View, Texas
University of Nevada-Las Vegas(UNLV)	Supporting Organization	Academia	Las Vegas, Nevada
Wyle Laboratories, Inc.	Supporting Organization	Industry	

Primary U.S. Work Locations

Nevada

Project Transitions

**September 2008:** Project Start**August 2010:** Closed out**Closeout Summary:** New project for FY2008.

Project Website:

<https://taskbook.nasaprs.com>

Organizational Responsibility

Responsible Mission Directorate:

Space Operations Mission Directorate (SOMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Human Spaceflight Capabilities

Project Management

Program Director:

David K Baumann

Project Manager:

Francis A Cucinotta

Principal Investigator:

Francis A Cucinotta

Co-Investigators:

Myung-hee Y Kim
Prem Saganti

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Technology Maturity (TRL)

Start: 3
Current: 5
Estimated End: 5



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.5 Radiation
 - └ TX06.5.1 Radiation Transport and Risk Modeling

Target Destinations

The Moon, Mars